

Focused Review: Net Ionic Equations

This assignment contains the net-ionic equation prompts that have been asked in released AP Chemistry Free Response Questions from 2014-2023. Items that asked for net ionic equations in the context of electrochemical cells have been omitted so that this assignment focuses more specifically on the concept of net ionic equations.

Net ionic equations are always worth one point in AP Exam scoring, and the point is not awarded if any formulas or charges are incorrect. Including state of matter symbols is not required and is not part of the scoring.

Answer the following questions about an experiment in which $\text{CaCO}_3(s)$ is combined with $\text{HCl}(aq)$, represented by the following balanced equation.



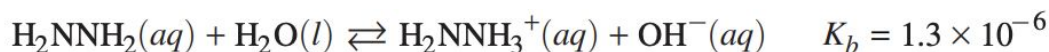
Write the balanced net ionic equation for the reaction.

The molar solubility of $\text{Ag}_2\text{C}_2\text{O}_4$ increases when it is dissolved in $0.5 \text{ M HClO}_4(aq)$ instead of neutral distilled water. Write a balanced, net-ionic equation for the process that occurs between species in solution that contributes to the increased solubility of $\text{Ag}_2\text{C}_2\text{O}_4(aq)$ in $\text{HClO}_4(aq)$.

For the precipitation experiment, the student adds 20.0 mL of $0.200 \text{ M Ba}(\text{NO}_3)_2$ to 50.0 mL of the $\text{CuSO}_4(aq)$. The reaction goes to completion, and a white precipitate forms. The student filters the precipitate and dries it overnight. The data are given in the following table.

Mass of dry filter paper	0.764 g
Volume of $\text{CuSO}_4(aq)$	50.0 mL
Volume of $0.200 \text{ M Ba}(\text{NO}_3)_2$	20.0 mL
Mass of filter paper and dried precipitate	1.136 g

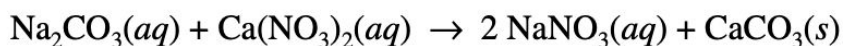
Write a balanced net ionic equation for the precipitation reaction.



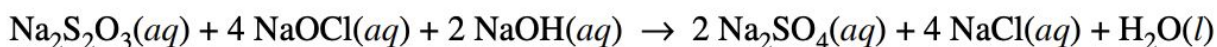
In aqueous solution, the compound H_2NNH_2 reacts according to the equation above. A 50.0 mL sample of 0.25 M $\text{H}_2\text{NNH}_2(aq)$ is combined with a 50.0 mL sample of 0.25 M $\text{HCOOH}(aq)$.

Write the balanced net ionic equation for the reaction that occurs when H_2NNH_2 is combined with HCOOH .

A student is given 50.0 mL of a solution of Na_2CO_3 of unknown concentration. To determine the concentration of the solution, the student mixes the solution with excess 1.0 M $\text{Ca}(\text{NO}_3)_2(aq)$, causing a precipitate to form. The balanced equation for the reaction is shown below.



Write the net ionic equation for the reaction that occurs when the solutions of Na_2CO_3 and $\text{Ca}(\text{NO}_3)_2$ are mixed.



Write the balanced net ionic equation for the given reaction.

A student is asked to make a buffer solution with a pH of 3.40 by using 0.100 M $\text{HNO}_2(aq)$ and 0.100 M $\text{NaOH}(aq)$.

Explain why the addition of 0.100 M $\text{NaOH}(aq)$ to 0.100 M $\text{HNO}_2(aq)$ can result in the formation of a buffer solution. Include the net ionic equation for the reaction that occurs when the student adds the $\text{NaOH}(aq)$ to the $\text{HNO}_2(aq)$.

Potassium sorbate, $\text{KC}_6\text{H}_7\text{O}_2$ (molar mass 150. g/mol) is commonly added to diet soft drinks as a preservative. A stock solution of $\text{KC}_6\text{H}_7\text{O}_2(aq)$ of known concentration must be prepared. A student titrates 45.00 mL of the stock solution with 1.25 M $\text{HCl}(aq)$ using both an indicator and a pH meter. The value of K_a for sorbic acid, $\text{HC}_6\text{H}_7\text{O}_2$, is 1.7×10^{-5} .

Write the net-ionic equation for the reaction between $\text{KC}_6\text{H}_7\text{O}_2(aq)$ and $\text{HCl}(aq)$.

Compound	Melting Point ($^{\circ}\text{C}$)
LiI	449
KI	686
LiF	845
NaF	993

Identify a compound from the table that can be dissolved in water to produce a basic solution. Write the net ionic equation for the reaction that occurs to cause the solution to be basic.

A student is given the task of determining the I^- content of tablets that contain KI and an inert, water-soluble sugar as a filler. A tablet is dissolved in 50.0 mL of distilled water, and an excess of 0.20 M $\text{Pb}(\text{NO}_3)_2(aq)$ is added to the solution. A yellow precipitate forms, which is then filtered, washed, and dried. The data from the experiment are shown in the table above.

For the chemical reaction that occurs when the precipitate forms,

- (i) write a balanced, net-ionic equation for the reaction, and
- (ii) explain why the reaction is best represented by a net-ionic equation.

Rhodium plating is a process used to protect sterling silver from tarnishing. This involves electroplating (depositing) solid rhodium, $\text{Rh}(s)$, onto the surface of the metal from an acidified solution of $\text{Rh}_2(\text{SO}_4)_3(aq)$. Oxygen gas is produced during this process.

(d) A table of half-reactions related to the overall reaction is provided.

Half-Reaction	E° (V)
$\text{Rh}^{3+}(aq) + 3 e^- \rightarrow \text{Rh}(s)$	+0.80
$\text{O}_2(g) + 4 \text{H}^+(aq) + 4 e^- \rightarrow 2 \text{H}_2\text{O}(l)$	+1.23

(i) Write the balanced net ionic equation for plating $\text{Rh}(s)$ from the acidified $\text{Rh}_2(\text{SO}_4)_3(aq)$ solution.